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## A LEPTOTHRIX ASSOCIATED WITH CHRONIC BRONCHOPNEUMONIA \*

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There are described in the literature cases of chronic pulmonary infection simulating tuberculosis in which tubercle bacilli were not found after repeated search and in which the tuberculin reaction was negative. There is considerable confusion in the nomenclature of these cases due in large part to the fact that the etiology is difficult to establish.

Thus cases of so-called pseudotuberculosis are described in which diphtheroid organisms have been isolated or in which the bacteriology has not been worked out. Another source of confusion is the variety of names applied to the filamentous organisms found associated with the infections. Wright<sup>1</sup> describes such infections under the head of nocardiosis and later<sup>2</sup> groups them under the term streptothricosis from streptothrix, a name sometimes applied to the whole group of filamentous organisms. Most authors follow a classification similar to that given by Jordan:<sup>3</sup>

Trichomycetes	{	Leptothrix—no branching
		Cladothrix—false branching
		Streptothrix—true branching, spores
		Actinomyces—true branching, no spores

There have been a number of infections of the lung in which streptothrix-like organisms were isolated in pure culture from the sputum. Claypole,<sup>4</sup> in a number of these cases, made skin tests similar to von Pirquet's, using preparations of 2 varieties of streptothrix analogous to Koch's old tuberculin. Specific reactions were obtained.

Pulmonary infections with leptothrix are rare. Leyden and Jaffe<sup>5</sup> describe such organisms in stains of the sputum of putrid bronchitis, but no growths were obtained. Kato<sup>6</sup> reports a pleuropneumonia which

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<sup>1</sup> Osler's Modern Medicine, 1907, 1, p. 340.

<sup>2</sup> Ibid., 1913, 1, p. 1045.

<sup>3</sup> General Bacteriology, 1910.

<sup>4</sup> Arch. Int. Med., 1914, 14, p. 104.

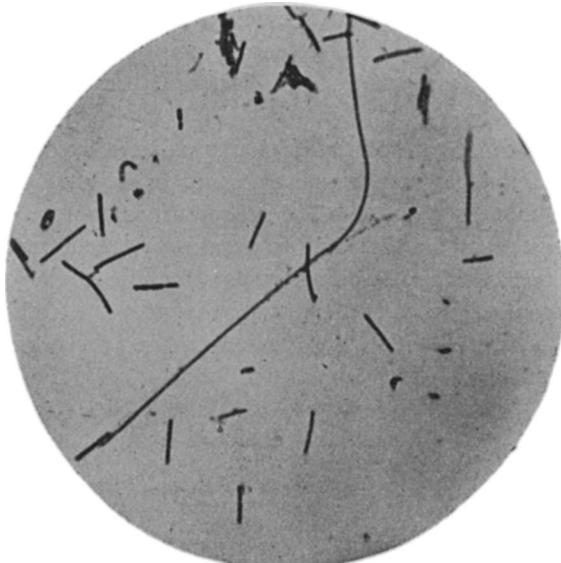
<sup>5</sup> Deutsch. Arch. f. klin. Med., 1867, 2, p. 488.

<sup>6</sup> Mitt. a. d. Med. Fakult. d. k. Univer. zu Tokyo, 1915, 13, p. 441.

they believe to have been caused by a leptostrix. The patient presented a clinical picture similar to that described here. The leptostrix isolated in pure culture was nonacidfast. The history of our case follows.

The patient was an unmarried American woman, aged 49 years. She had had typhoid fever at 14 years, but no other illness so far as she could remember. She gave no history of association with tuberculous persons.

About 1 month before admission to the hospital, the patient had caught cold and had had a chill followed by sharp pain in the left side of the chest and cough. The sputum was profuse, thick, and of a dark color. Later it became thin, frothy, and colorless except for yellow flakes. The pain diminished in intensity and frequency.



The leptostrix associated with chronic bronchopneumonia.  $\times 1200$ .

The patient was somewhat emaciated. The respiratory excursion was diminished on the right side of the chest. Vocal fremitus was decreased over the lower lobe of the right lung. The percussion note over the right back was dull at the middle of the scapula, the dullness increasing toward the base where it merged into flatness. There was no sharp line marking the beginning of this dullness and it did not shift on change of the patient's position. The breath sounds over the upper part of the dull area were bronchial, but louder in some places than in others. At the base they were suppressed. Mucous and submucous râles were heard over the lower right chest behind and fewer over the lower left back.

The skiagraph of the chest showed a diffuse shadow over the lower right lobe with here and there more intense shadows 1-3 cm. in diameter. The left border of the heart was 10 cm. from the mid-sternal line. There was a faint soft systolic murmur heard at the apex and transmitted somewhat

to the left of the area of cardiac dulness. There was a slight accentuation of the pulmonic second sound.

The blood showed 4,952,000 erythrocytes; 11,350 leukocytes; 76% (Sahli) hemoglobin. The systolic blood pressure was 125 mm. A Wassermann test of the blood serum was negative.

The urine had a specific gravity of 1.007. Albumin +. No casts.

The patient had a fever for a month after entering the hospital. The temperature was irregular, higher in the afternoon than in the morning, and varied from 97 to 100.6 F. The physical signs changed gradually. The dullness became less marked, the râles diminished in number, and in 2½ months were no longer heard. The breathing lost its bronchial character. Some dullness, however, remained as long as the patient was under observation, tho she had regained her weight and felt well.

The sputum was examined repeatedly by the antiformin method for tubercle bacilli, but none were found.

Cultures of the sputum were made on blood-agar slants aerobically and anaerobically. The aerobic cultures yielded *Streptococcus viridans*, *Micrococcus catarrhalis*, and some small gram-negative organisms resembling diphtheria bacilli in morphology, but very slender.

The anaerobic cultures showed many colonies of gram-positive organisms growing in filaments and bacillary forms. The organisms were found plentifully in direct smears of the sputum. The pure cultures when stained with carbolfuchsin and decolorized with 10% hypochloric acid in 95% alcohol were for the most part decolorized, but sections of filaments and granules in the filaments retained the fuchsin so that smears counter-stained with methylene blue showed the long blue filaments with red dots and dashes spaced irregularly. Some of the short forms retained the fuchsin and others did not. In direct smears of the sputum the organisms were nonacidfast. They grew fairly well in anaerobic cultures on blood agar. The colonies developed in 5-6 days as small translucent flat discs, reaching a maximum of 1 mm. in diameter. In subsequent transfers growth appeared at the end of 48 hours, and at the end of 5 or 6 days the blood agar had become brown. In anaerobic dextrose ascites broth the organism tended to form colonies, which sank to the bottom of the medium. There was no growth on ordinary media and none aerobically.

A skin test was made with a suspension of the killed organisms. On account of the difficulty of applying enough material by the cutaneous method an intracutaneous injection was used similar to the intracutaneous tuberculin test of Mantoux. By inoculation of 3 individuals free from pulmonary infection with graded doses of killed organisms it was found that 0.1 c.c. of a suspension of approximately 500,000,000

organisms per c.c. produced no reaction. This amount was injected intracutaneously over the outer aspect of the upper arm of the patient, and 0.1 c.c. of a 1: 5000 solution of old tuberculin injected in the same way in the other arm. The tuberculin, which was in an amount recommended by Mantoux and others, produced no reaction, while the lepto-thrix injection was followed by redness and induration, which was well marked from 24 to 48 hours following the injection, subsiding in about 3 days.

Rabbits injected intravenously with the organism either died overnight, when a large dose was given, or were not affected at all. No experimental pulmonary infection was obtained.

The morphology of the lepto-thrix is shown in the photomicrograph.